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STUDY PLAN OF THE EFFECT OF PINE BUTTERFLY DEFOLIATION ON PONDEROSA PINE IN SOUTHERN IDAHO

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TABLE OF CONTENTS

INTRODUCTION 1

IMPORTANCE OF STUDY 1

SCOPE OF STUDY 2

PAST WORK 2

OBJECTIVES OF THE STUDY 3

METHODS 3

Field Methods

Selection of trees 3

Sampling 4

Office Methods

Measurement of increment 4

Analysis of data 4

Reports 4

PROBABLE COSTS 5

DATE OF COMPLETION 5

ASSIGNMENT 5

LITERATURE CITED 6

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INTRODUCTION

Observations from 1950 to 1952 indicated that the pine butterfly, Neophasia menapia (F. & F.), was increasing on the Boise National forest in Idaho. In the summer of 1953 severe defoliation became evident in an area between Deadwood Reservoir and the Middle Fork of the Boise River (2).

The 1953 aerial and ground surveys disclosed a total of 169,000 acres of mature, high-value ponderosa pine to be infested. In 1954, 255,403 acres were aerially sprayed resulting in a reduction of 99 percent of the pine butterfly population (12).

Outbreaks of pine butterfly have occurred rather infrequently; in 1882 in the Washington Territory near what is now Spokane (11), in 1893-96 on the Yakima Indian Reservation (8), in 1922-23 along the Little Salmon-Payette Rivers in Idaho (5), and during 1953-54 on the Boise National Forest.

IMPORTANCE OF STUDY

The pine butterfly is a serious pest of ponderosa pine. In addition to killing many trees, as shown during previous epidemics, it leaves many other trees in poor condition because of severe defoliation. These defoliated trees may be more attractive to bark beetles. This study will determine several facts bearing on effects of defoliation on ponderosa pine.

1. By comparison of data from a study by Evenden (6), the effects of the 1954 control project might be revealed in degree of recovery and percentage of loss in contrast to the earlier uncontrolled epidemic.

2. By determination of loss of increment due to defoliation it may be possible to place a value on loss of increment in trees that do recover.

3. A parasite of the pine butterfly, Theronia atalantae (Poda.) appears to be highly effective during the late stages of an epidemic. It is essential to know more about the effectiveness and life habits of this species.

SCOPE OF STUDY

The study will emphasize only those points pertaining to the evaluation of loss, death, or reduced increment of ponderosa pine. In fact, the preliminary work for this study was started in October 1953. At that time, 300 trees were marked and the following types of data recorded: d.b.h., Keen class, position, crown class, percent of defoliation and their chances of recovery estimated. These trees were scored as to recovery in 1954 and again in 1955. A progress report is being prepared.

PAST WORK

Several workers have studied effects of defoliation on host trees, but with defoliators other than the pine butterfly. Evenden (6), however, presented quite a comprehensive report following the 1922-23 pine butterfly outbreak near New Meadows, Idaho.

It was reported by Evenden that 26 percent of mature trees died and that "no definite relation exists between crown classes or diameters and subsequent mortality of the injured trees; .... the severity of defoliation was the governing factor." Increment cores showed reduction of basal growth which followed defoliation and "the number of years over which effects of defoliation may be extended."

A well planned study by Reynolds, Clark, and Coyne (10) was conducted in 1947-49 on growth loss of shortleaf and loblolly pine from defoliation by a pine sawfly. In their report the loss due to defoliation was converted to monetary value.

The work of Duff and Nolan (4) on the growth of Pinus resinosa will be helpful in determining years of defoliation. Their report is being thoroughly reviewed.

Craighead (3) and Graham (7) not only used small, nursery-size trees but different tree species, in their artificial defoliation experiments. Their techniques and general conclusions will be considered in this particular study.

Church's (1) conclusions, obtained using balsam fir, are similar to previous findings; that reduction in diameter growth is not uniform throughout the stem, and that tree vigor has a definite influence on recovery of injured trees.

OBJECTIVES OF THE STUDY

This study is planned to obtain information on effects of defoliation by the pine butterfly on ponderosa pine in southern Idaho.

Evenden (6) conducted a similar study from 1923-1934 following the pine butterfly epidemic near New Meadows, Idaho. This particular epidemic was controlled by natural factors while the present study will be conducted in an area where the epidemic was controlled at its peak by aerial spraying. A comparison of results will conclude the study.

The main objectives of this study are twofold:

A. To determine percent of mortality, and/or recovery, of ponderosa pine defoliated by the pine butterfly prior to control.

B. To determine the amount and value of loss of increment of ponderosa pine due to defoliation by pine butterfly.

Additional information to be gained is: (1) notes on endemic populations of the pine butterfly, (2) information on overwintering habits, (3) possible secondary hosts, and (4) notes on the life history of Theronia atalantae (Poda.), an effective parasite of the pine butterfly.

METHODS

The methods to be employed in this study are as follows:

Field Methods

Selection of trees. Three hundred ponderosa pine trees were selected in 1953 on the Boise National Forest. Defoliation of these trees ranged from 20 to 95+ percent. Trees of all age classes and varying diameters, from 11 to 57 inches d.b.h., were included.

Location of trees were in four separate heavily infested areas:

(1) Swanholm Creek - 75 trees
(2) Owl-Lost Creek - 50 trees
(3) Beaver Creek - 100 trees
(4) Banner Mine Road - 75 trees

Of these trees, 37 have been logged in the Owl Lost Creek area.

Trees for check purposes will be selected insofar as possible from comparable sites, diameter classes, and crown classes within areas that were not affected by pine butterfly. These trees will be used to compare growth patterns.

Sampling. Annual inspections have been, and will continue to be made, during which recovery or loss will be regraded. In 1960 increment cores will be taken from both defoliated and non-defoliated trees remaining and the growth measured. This will allow seven years since severe defoliation or six years since control of the pine butterfly.

Office Methods

Measurements of increment. Reduction or increase in increment rate will be measured to 0.01 mm accuracy by use of an increment core measuring device supplied by the California Forest and Range experiment Station.

Analysis of data. Much of the information will be derived from a comparison of growth patterns of defoliated and healthy trees. Loss of increment due to the defoliation of the 1953 epidemic will be compared to data obtained by Evenden, from the 1922-23 epidemic, to evaluate the effect of control of pine butterfly. Comparisons of deterioration and/or recovery will be made for corresponding years of the two epidemics; i.e., first, second, or third year of defoliation. An attempt will be made to correlate tree mortality by years with original percent of defoliation and tree vigor.

Reports. Annual progress reports and a concluding report of the study will be written.

PROBABLE COST

Field Phase

1 GS-7 (1 pay period)	$174.04
Travel (1 pay period)	70.00
Vehicle (10¢ mile for 150 miles)	15.00

Office Phase

1 GS-7 (3 pay periods)	522.12
1 GS-3 (WAE, $1.56 hr. for 50 hrs.)	78.00
Estimated cost per year for personnel	$ 859.16

Equipment

1	Increment core measuring device
1	10" increment borer
1	Diameter tape
	Forms
12	1-pint pressure-type cans of paint
500	malt straws
6	3" x 9" mailing cans

Total cost estimate of study (1956-1960) $3500.00

DATE OF COMPLETION

The field phase of the study will be completed in the fall of 1960, office work should be completed and final report written by the spring of 1961.

ASSIGNMENT

W. E. Cole, Division of Forest Insect Research, Boise, Idaho, will be responsible for the conduct of the study and for the temporary personnel employed for the study.

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